

UNITED STATES OF AMERICA
BEFORE THE
UNITED STATES DEPARTMENT OF ENERGY

Considerations for Transmission Congestion
Study and Designation of National Interest
Electric Transmission Corridors

Notice Of Inquiry

**COMMENTS OF THE PUBLIC WORKS
COMMISSION OF THE CITY OF FAYETTEVILLE,
NORTH CAROLINA**

I. INTRODUCTION AND GENERAL PROBLEM

The Public Works Commission of the City of Fayetteville, North Carolina (hereafter “Fayetteville” or “PWC”) appreciates this opportunity to respond to the Department of Energy’s Notice of Inquiry, “Considerations for Transmission Congestion Study and Designation of National Interest Electric Transmission Corridors,” which was published in the Federal Register on February 2, 2006. 71 Fed. Reg. 5660. PWC is a member of ElectriCities of North Carolina, Inc., and thus a member of the Transmission Access Policy Study Group (“TAPS”), which is filing generic overall comments today in this proceeding. We agree with those TAPS comments, but wish to add specific factual material to this record, as the TAPS comments have suggested will be done by TAPS members. The NOI as issued spells out:

In that regard, if interested parties believe that there are geographic areas or transmission corridors for which there is a particularly acute need for early designation as NIETC, the Department invites interested parties to identify those areas in their comments on this NOI. If such areas are identified, the Department will consider whether it should complete its congestion study for that area in advance of the larger national study discussed elsewhere in this NOI, and proceed to receive comment and designate that area as an NIETC on an expedited basis. If interested parties wish to identify areas for early

designation, they should supply with their comments all available data and information supporting a determination that severe needs exist. Parties should identify the area that they believe merits designation as an NIETC, and explain why early designation is necessary and appropriate. The Department will only consider for early designation as NIETCs those corridors for which a particularly compelling case is made that early designation is both necessary and appropriate, and for which data and information are submitted strongly supporting such a designation.

Fayetteville owns and operates a municipal electric system that provides retail electric service to residential, commercial, and industrial customers in the City of Fayetteville, North Carolina and surrounding areas. In connection with this service, Fayetteville owns and operates generation, transmission, and distribution facilities used to provide electric service to the public. Fayetteville is interconnected with Carolina Power & Light Company, also known as Progress Energy Carolinas, Inc.¹

On August 16, 1999, Fayetteville issued a request for proposals for firm power supply to meet its demand and energy requirements beginning July 1, 2003. In response to that RFP, Fayetteville received a number of proposals, and found that most sellers had proposed to utilize one version or another of the form contract prepared by a committee of representatives of Edison Electric Institute and the National Energy Marketers Association member companies (referred to hereinafter as the "EEI Agreement"). As a result of that RFP process Progress Energy was selected as the successful bidder and three interrelated agreements were – after extended negotiations – entered into and became effective on July 1, 2003: a Master Power Purchase and Sale Agreement, a

¹ We will refer to CP&L (or Progress Energy Carolinas, Inc.) as "Progress Energy" or simply "Progress" herein. Although there is also a Progress subsidiary in Florida, this filing addresses only issues applicable to Progress Energy Carolinas.

Marketing Agency Agreement, and a Scheduling and Services Agreement. Those agreements continue in effect through June 30, 2012. Under those agreements, Fayetteville purchases firm base and intermediate power supply from Progress, and supplies the balance of its requirements from its own peaking resources or from short-term market purchases when available. Fayetteville also became a network transmission customer of Progress Energy under its OATT, although PWC has approximately 200 MW of internal generation serving part of its load, which is approaching 500 MW on peak.

Under those agreements, PWC is entitled to purchase power and energy above the amounts purchased from Progress from other competitive entities if it is cheaper for it to do so. But Fayetteville has found that transmission constraints on the Progress system severely limit its ability to actually purchase energy from short term markets outside the Progress control area to displace more expensive energy from its own generation facilities. The last time Fayetteville was able to make any off-system purchases from outside the Progress control area was more than a year ago, in December, 2004. Fayetteville's inability to purchase in the short-term market is largely due to physical limitations on the Progress system.²

Even more serious, however, than the inability to purchase power on the short-term market, is the lack of transmission capacity for power supply alternatives when the current contract expires in 2012. Progress undertook a Scoping Study of interface capacity which found that starting in 2010 there will be no long-term firm transmission capacity available for importing power into the Progress control area in

North Carolina. Furthermore, the most likely transmission upgrades to alleviate this limitation could not be placed into service until 2016 or after. Because Fayetteville is a network transmission customer, Progress is responsible for planning its transmission system to provide for the needs of Fayetteville as well as for Progress's own needs. When Fayetteville's current power supply contract with Progress expires in 2012, however, if something is not done, it will be foreclosed from power supply options outside the Progress control area, and Progress is the only entity with sufficient base and intermediate power supply inside that area potentially available to meet Fayetteville's needs.³ Consequently, Fayetteville will be limited to the current transmission supplier as its only power supplier option, unless new generating resources are constructed. Fayetteville is willing to participate in any way needed to promote transmission access and will consider joint ownership of a load ratio share of the transmission grid, if that will expedite transmission improvements. However, the failure of the transmission provider to solve this basic problem is a failure to meet the obligation to build for the needs of network customers (as well as for Progress's own customers). Clearly, something further needs to be done to assure transmission adequacy to support a competitive market.

² There may also be artificial constraints associated with the methods of calculating ATC and TRM.

³ There is some potential that peaking capacity will be built by North Carolina Electric Membership Corporation, but no indication known to Fayetteville of base or intermediate power capacity being built.

II. DETAILED DESCRIPTION OF WHY THE IMPORT LIMITATIONS OF PROGRESS SHOULD QUALIFY FOR EARLY NIETC DESIGNATION

A. Standards

As noted in the TAPS comments, TAPS members generally agree with the criteria proposed to be used in identifying transmission corridors of national interest. With respect, we believe that proposed criteria 1, 2, 3, 5, 6, 7 and 8 are met.

B. Short-Term limitations

As described above, Fayetteville currently receives its base and intermediate power requirements (approximately 300 MW) from Progress under an agreement which extends until June 30, 2012. The balance of Fayetteville's requirements is supplied from its own peaking generation, which is located in Fayetteville (approximately 200 MW), or from short-term market purchases when transmission is available. Fayetteville receives network transmission service from Progress under its OATT. The term of the transmission service coincides with the power supply commitment.

Because of current transmission constraints, Fayetteville is unable to purchase energy from the short-term resources outside the Progress control area to displace more expensive generation from its own resources (the Butler-Warner generating plant). Every morning at about 0720 a conference call takes place between the Progress traders and Fayetteville Control Room personnel. The purpose of this call is to develop plans for covering the projected Fayetteville load for the following day. The plans that were made on the preceding day for covering the Fayetteville load for the current day are also revisited at that time to determine if additional resources are going to be required or if the availability of any resources that were expected to be used has changed overnight. During that conference call, Progress advises Fayetteville whether there is any import

capability to make market purchases of energy at a lower price than the cost of Butler-Warner generation. On every day during the summer months of 2005 for the hours that Fayetteville's load was above the floor, the report from Progress has been that there is no import transmission capacity available. On some of those days, there may not have been energy available at a lower cost, but there would have been no transmission availability in any event. The last time PWC was able to make any off-system purchase from outside the Progress control area was in December 2004. Thus it seems clear that even now there is no ability to obtain electricity at a competitive price in the wholesale market (Draft Criterion 5, since it is stated national policy to have a competitive wholesale market; see also Draft Criterion 2 and 3).

C. The Prospect for Long-Term Relief Is Bleak

As noted above, studies conducted by Progress in connection with efforts by North Carolina Electric Membership Corporation to import long-term firm power supply into the Progress control area showed, among other things, that starting in 2010, there will be no long-term firm transmission capacity available for importing power into the Progress control area. While the limiting factor (a phase-angle difference at a point of interconnection with Duke Power) could be corrected through construction of a new high-voltage transmission line to the Progress interties with the Duke system, such a line could not be placed into service until 2016 or after.

Attached as Exhibit A is an Import Scoping Study prepared by Progress on April 23, 2004, evaluating constraints at interties with other utilities. It shows that interties are constrained and concludes that, in order to provide 250 MW of additional import capability, the most cost effective alternative would be to upgrade the

Cumberland-Richmond-Newport tie line with Duke Power, which was estimated to cost \$350 million and require at least ten years to complete. Obviously, this schedule would mean that Fayetteville will be deprived of any other alternative for supply of base and intermediate power (what is needed after the use of its own on-system peaking resources) when the current power supply contract expires in 2012, and that Progress has not expanded its transmission system for the known needs of network transmission customers like Fayetteville, as it is obligated to do.

Fayetteville believes that there should be a full evaluation of shorter term and less expensive options for interim relief on the tie line with Duke Power, such as modifications in switching facilities to allow the tie line to be loaded more fully. The additional capacity would be beneficial in the near term to provide much needed inertia capability until the proposed longer term project can be undertaken.

Among the alternatives being considered by Fayetteville are construction of its own transmission facilities to interconnect with suppliers outside the Progress control area and the construction of additional Fayetteville generation facilities to supply its base and intermediate power requirements. Neither of these options is the most efficient alternative, however.

Construction of transmission facilities likely will extend more than fifty miles and cross the path of Progress Energy's own 500 kV transmission lines. Construction of 300 to 400 MW of base load generation independently would not be the most efficient alternative either. Further, Fayetteville is not likely to be able to obtain environmental approvals to construct additional gas or coal-fired generation in its service territory.

Fayetteville will participate in any reasonable way needed to promote transmission access to more economical generation alternatives. Fayetteville also is willing to consider joint ownership of a load ratio share of the transmission grid if that will expedite funding of transmission improvements.

Fayetteville has participated, through ElectriCities of North Carolina, Inc., in a series of stakeholder meetings sponsored by the North Carolina Utilities Commission ("NCUC"), designed by the NCUC to "become better informed about the status of the electric transmission facilities in North Carolina and the potential transmission-related issues that might arise in the future" and to "identify any specific electric transmission issues that have the potential to impact the ability of transmission dependent load-serving entities to provide reliable and adequate service to their retail customers." The NCUC-sponsored process led to the recently executed "North Carolina Load Serving Entities' Transmission Planning Participation Agreement" among ElectriCities, NCEMC, Progress and Duke Power. While we are all hopeful that the process there established will lead to an adequate transmission network plan to solve the problems in the Progress region, over ten years will be needed, by Progress's own assessment. This time frame as estimated by Progress is not adequate to address Fayetteville's needs. We believe that this situation warrants designation of a transmission corridor in North Carolina by DoE to facilitate the necessary transmission system upgrades.

Since it seems clear that NIETC listing will help speed up planning and construction, and since it also appears clear that on a long-term basis the existing problem clearly meets Draft Criteria 1 (reliability), 2 (economic benefit for consumers), 3 (action needed to ease supply limitations in corridor), 5 (action would further the national energy

policy of wholesale competition), 6 (action is needed to enhance the reliability of electric supply to critical loads and infrastructure), and 7 (alternatives have been thoroughly studied), Fayetteville respectfully requests that the constraints in the Progress Energy Carolinas grid which limit the ability of entities like Fayetteville to import power be included as a part of the NIETC listings.

Respectfully submitted,

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EXHIBIT A

**Progress Energy Carolinas, Inc.
Eastern Area Transmission System
Import Scoping Study**



Progress Energy

**April 23, 2004
Transmission Department
Progress Energy Carolinas, Inc.**

PEC Eastern Area Import Scoping Study

Purpose

The purpose of this study is to address an issue that has been found to limit future import capability of the Progress Energy Carolina's (PEC) eastern control area. This study was performed following results of OATT studies performed in association with a request for transmission service, specifically OASIS request # 216803. This request was for a 250 MW import into PEC sourcing from Dominion Virginia Power and sinking in the PEC control area beginning January 1, 2005. The Customer requested rollover with this request. Results of the study concluded that PEC was unable to confirm the import beyond 2009 due to an emerging issue with post-contingency phase angle difference on its Duke 500 kV interface in the south-western part of its system.

PEC's 500 kV EHV Transmission System

PEC's bulk transmission system includes 300 miles of 500 kV EHV transmission that is the backbone of the PEC system. PEC has 5-500kV substations. PEC interconnects with Duke Energy in the south-western part of its system at the Richmond 500 kV Substation and with Dominion Virginia Power in the northern part of its system at the Wake 500 kV Substation. The Cumberland 500 kV Substation is an intermediate station between Richmond and Wake. At these 500kV stations 500/230kV transformers serve PEC's underlying 230 kV systems. Also included is a 500 kV line extending from Wake 500 kV Substation to PEC's Mayo 500kV Substation and terminating at the Person 500 kV Substation. In addition to providing load serving capability for PEC control area load, the 500 kV system also provides through-flow for inter- and intra- regional transfers for flows in support of power movement in SERC and flows for transfers into or out of SERC with surrounding control areas in ECAR, MAAC, MAIN, and PJM.

Phase Angle Criteria

PEC currently uses phase angle as a criteria to manage the design and operation of its transmission system. For circuits that normally carry significant power flows, the phase angle difference of the circuit when opened provides a means of monitoring the severity of system impacts when closing the circuit. Closing a circuit with a large phase angle difference produces a step-change in power flow on area generation that can have adverse consequences to reliability. This step-change is influenced by system impedances and power-flows. Power-flow is a function of system configuration, generation pattern, and active internal and external scheduled transactions. Adverse consequences of closing breakers with large phase angle differences may include,

- Damage to transmission infrastructure due to potentially catastrophic switching transients that exceed breaker capabilities.
- Increased potential for area transmission outages.
- Damage to the rotating and stationary components of area generating units due to transient and oscillating mechanical forces.
- Increased potential of area generating unit trips.

PEC Eastern Area Import Scoping Study

Published industry standards, specifically, IEEE Standard C37.102-1995, provide guidance on this issue. Based on historical experience and lessons learned from past events, PEC utilizes a 30° phase angle difference as its limit. Sync-check relay protection incorporates this limit by design to not allow closing of a breaker if sync-check measures more than a set 30° phase angle difference. This relay safeguard is to prevent the introduction of a disturbance on the PEC transmission system that could affect generation stability in the area and possibly result in equipment damage and an adverse impact on grid reliability. PEC currently has developed a special operating procedure that consists of a sequence of switching operations when a 30° difference is encountered at certain points of its 500 kV system.

Emerging Phase Angle Issue

Results of studies for OASIS #216803 concluded that PEC was able to confirm portions of the import request through 2009 but not beyond due to post-contingency phase angle differences. Studies show that if the Richmond – Newport 500kV line experienced an outage during periods of high control area imports, the additional line loadings associated with request #216803 would result in a phase angle differential greater than 30° at the Richmond 500 kV terminal which will prevent the circuit breaker from reclosing. Quickly returning the circuit back to normal is necessary under NERC requirements¹. Not being able to reclose this 500 kV line would have adverse impact to transmission grid reliability. For use when this condition is present, PEC has developed an Operating Procedure which identifies a sequence of switching instructions that will allow this 500 kV transmission line to be returned to its normal configuration when the phase angle difference is up to 35° (i.e. this operating procedure reduces the phase angle difference approximately 5°). At the time of studies for OASIS request #216803, additional imports rendered this Operating Procedure ineffective beyond 2009.

Methodology

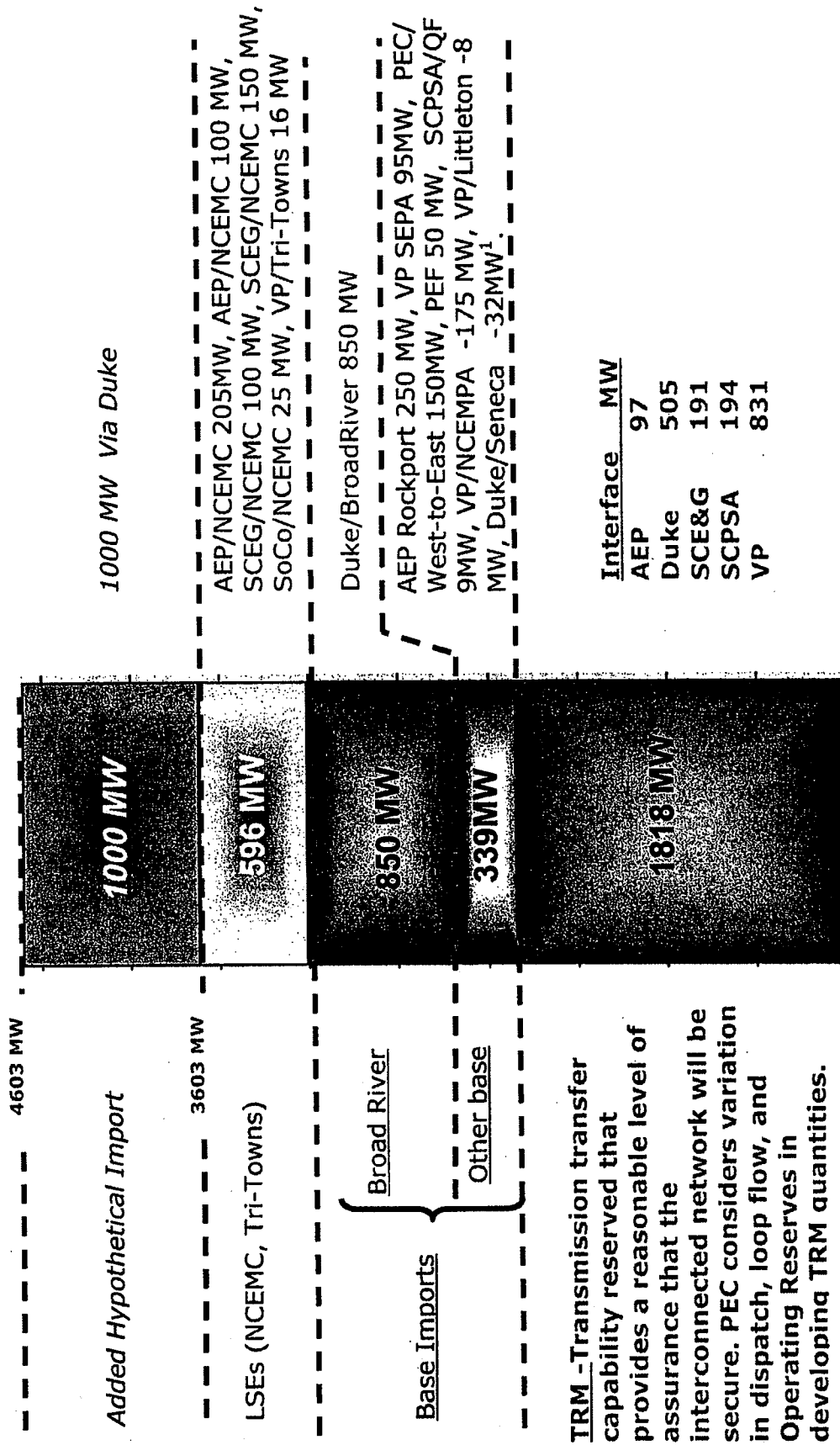
The goal of this initial study is to scope a potential transmission solution that would support PEC's current 2010 import obligations plus an additional import of 1000 MW. It was necessary to specify a source for the additional 1000 MW. Since the phase angle issue is associated with PEC's 500 kV tie with Duke, Duke was chosen as the source of the additional import. The year chosen for the study was 2010 since the results of studies for OASIS #216803 indicated limitations after 2009. The size, source and schedule for this hypothetical import were assumed for the purpose of this scoping study only.

An import power flow case was developed. The interchange consisted of PEC's control area import obligations for 2010 summer. Interchange included import reservations of load serving entities, required import from SEPA for control area preference customers, imports for PEC native load, and transmission margin reserved for the benefit of all control area load. A listing of these reservations is shown graphically in Figure 1. Base imports total 3603 MW and 4603 MW with the additional 1000 MW import.

¹ Compliance with NERC Operating Policy 2, following a contingency or other event that results in an OPERATING SECURITY LIMIT violation, the CONTROL AREA shall return its transmission system to within OPERATING SECURITY LIMITS soon as possible, but no longer than 30 minutes.

2010 Summer PEC Control Area Obligations & Test Import

Figure 1



TRM -Transmission transfer capability reserved that provides a reasonable level of assurance that the interconnected network will be secure. PEC considers variation in dispatch, loop flow, and Operating Reserves in developing TRM quantities.

¹Negative entries are exports permitted to net during import studies.

PEC Eastern Area Import Scoping Study

Solutions Tested

Power normally flows into the PEC system from Duke on the 500 kV tie line. Study case base flows on the 500 kV tie line are approximately 1300 MW and increase to approximately 1450 MW with the additional 1000 MW import. The phase angle at Richmond with the additional 1000 MW import is 37°.

Studies showed that PEC system response to the additional 1000 MW on the Duke interface is approximately 37% of the additional 1000 MWs with the Richmond-Newport 500 kV tie-line directly carrying approximately 15%. Solutions were tested that were projected to reduce the loading on the 500 kV interface with Duke.

With a regional perspective, potential transmission solutions were narrowed down to those thought to best reduce the 500 kV import flows into PEC's Richmond 500 kV Station. The results below in Table 1 show the impact on phase angle for seven different projects that were projected to provide the most improvement to the phase angle. As shown below, the best solution was found to be the Cumberland-Richmond-(Duke)Newport 500 kV Line, which would be a new tie line between PEC and Duke Energy. The next best solution in the study was the Cumberland-Richmond-(Duke)Pleasant Garden 500 kV Line which is comparable in length and cost but produces less reduction to phase angle.

Table 1: Impact of Alternatives on Richmond Phase Angle

Transmission Alternative	Richmond 500 kV Angle (Open Terminal)
No Project	37°
Person-(AEP)Axton- 500 kV Line	34°
Person-(VP)Clover 500 kV Line	36°
Durham-(AEP)Axton 500 kV Line	33°
Durham-(Duke)Parkwood 500 kV Line	34°
Cumberland-Richmond-(Duke)Pleasant Garden 500 kV Line	28°
Cumberland-Richmond-(Duke)Newport 500 kV Line	15°

Cost

The Cumberland-Richmond-(Duke)Newport 500 kV Line would be approximately 145 miles in length with roughly 50 miles located in the Duke Energy service territory. Also, 25 of those 50 miles in Duke's territory would be located in South Carolina with the remainder of the line located in North Carolina. It is estimated that the average cost per mile of building this line would be \$2 million, therefore, the 145 miles of line would cost approximately \$290 million (PEC and Duke). Other underlying transmission expansion to existing infrastructure would be necessary to distribute the power flows internal to the PEC transmission network. An estimate of the additional PEC transmission and its cost is provided in Table 2. This additional expansion is estimated to cost in the neighborhood of \$60 million. It is expected that this new 500 kV tie-line would also necessitate additional upgrades to Duke Energy's transmission system. While PEC has met and shared this issue with Duke Energy, estimates

PEC Eastern Area Import Scoping Study

of Duke costs for other upgrades are not provided in this report. The total costs of the new 500 kV interconnection and additional PEC internal transmission upgrades would be approximately \$350 million not including additional Duke Energy expansion requirements.

Table 2: Additional PEC Internal Transmission Expansion

Other Issues	Potential Solutions	Cost
Wake 500/230kV banks	Up-rate Wake 500/230kV Banks	\$20M
Richmond-Rockingham 230kV	Richmond-Rockingham 230kV #2	\$5M
Durham-Cary Regency Park 230kV	Harris - Durham 230kV	\$15M
Sutton-Castle Hayne S. 230kV	Up-rate Sutton-Castle Hayne S. 230kV	\$2M
Falls 230/115kV Bank	Add Falls 230/115kV Bank #2	\$10M
Method-East Durham 230kV	Loop E. Durham-Method 230 kV into Durham 230	\$3M
Harris LOCA Voltage	TCUL-Aux Transformers Harris Plant	\$5M
	Estimated Additional Cost	\$60M

PEC Eastern Area Import Scoping Study

Schedule

The schedule to complete this 500 kV line was developed based on PEC's recent experiences in constructing lower voltage transmission as well as other known industry experiences in building EHV lines. Table 3 shows an estimate of the time schedule to construct this 500 kV tie-line. Based on this 9 to 12 year estimate, the earliest possible in-service date would be in the range of 2013 to 2016.

Table 3: Schedule

Event	Time Estimate
Coordination with Duke Energy	1 year
Siting / Permitting	2-5 years ²
Survey	0.7 years
Acquire ROW	2.0 years
Clear ROW	1.0 year
Foundations	0.5 years
Construction	2.0 years
Total	9-12 years

Risks

There are many risks that could impact the completion of this 145 mile 500 kV project. In addition to federal requirements, construction of this 145 mile 500 kV project will involve two states and therefore two state regulatory commissions. Potential risks associated with regulatory approvals, public opposition, ROW acquisition and construction could increase the time required to complete this project and result in a cost higher than the current preliminary estimate.

Summary

This report is a result of a continuing effort to scope a possible solution to the PEC eastern control area import limitation. PEC has met with and held several discussions with Duke Energy on this issue. PEC is continuing to study the situation.

² AEP's Jackson Ferry-Wyoming 765 kV line required 12 years to permit